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FACSIMILE TRANSMISSION

To: Examiner Jaworski

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From: John S. Sensny

Re: Proposed amendment to U.S. patent application 08/746,360

COMMENTS:

Please deliver immediately to Examiner Jaworski

Examiner Jaworski:

In accordance with our telephone conference, we are transmitting herewith a proposed set of claims for the subject patent application. Please telephone us after you have had an opportunity to review these proposed claims. Thank you.

John Sensny
Reg. No. 28,757

If there are any problems concerning this facsimile, please call (516) 742-4343 and ask for John Sensny

DRAFT

Proposed new Claims 29-53 for U.S. Patent application no. 08\746,360

29. A method of imaging a biological sample, comprising the steps of:

generating an initial ultrasonic signal at a fundamental frequency;

directing the ultrasonic signal into and along a propagation path in the sample, wherein the sample causes finite, non-linear amplitude distortion of the ultrasonic signal along the propagation path and thereby produces a distorted ultrasonic signal comprised of a first order component signal and higher order harmonic component signals at the fundamental and higher order harmonic frequencies respectively, and further wherein the sample also reflects the distorted ultrasonic signal including the first order and the higher order harmonic components thereof;

receiving the higher order harmonic components of the reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal along the propagation path and caused by the sample;

forming an image principally from one of said received higher order harmonic components of the reflected distorted ultrasonic signal; and

displaying said formed image.

30. A method according to Claim 29, further including the step of maintaining the sample substantially free of any contrast agent while directing the initial ultrasonic signal into and along the propagation path in the sample.

31. A method according to Claim 30, wherein:

the higher order harmonic component signals include a second order harmonic component and further, higher order harmonic components; and

the forming step includes the step of forming the image principally from the second order harmonic component.

32. A method according to Claim 31, wherein the step of forming the image principally from the second order harmonic component includes the step of useing small contributions from the further, higher order harmonic components to form the image.

33. A method according to Claim 29, wherein:

the receiving step includes the step of also receiving the first order component signals of the reflected, distorted ultrasonic signal; and

the step of forming the image principally from one of the higher order component signals includes the step of removing from the received signals the first order component signal of the reflected distorted ultrasonic signal.

34. A method according to Claim 29, wherein:
the higher order harmonic component signals include a second order harmonic component and further, higher order harmonic components;
the receiving step includes the step of also receiving the first order component of the distorted ultrasonic signal; and
the forming step includes the step of removing from the received signals substantially everything other than the second order harmonic component.

35. A system for imaging a biological sample, comprising:
means for generating an initial ultrasonic signal at a fundamental frequency;
means for directing the initial ultrasonic signal into and along a propagation path in the sample, wherein the sample causes finite, non-linear amplitude distortion of the fundamental signal along the propagation path, and said distortion produces a distorted ultrasonic signal comprised of a first order component and higher order harmonic components at the fundamental and higher order harmonic frequencies respectively, and wherein the sample also reflects the distorted ultrasonic signal including the first order and the higher order harmonic components thereof;
means for receiving the higher order harmonic components of the reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal along the propagation path and caused by the sample;
means for forming an image principally from one of said received higher order harmonic components of the reflected distorted ultrasonic signal; and
means for displaying said formed image.

36. A system according to Claim 35, for use with a sample that is substantially free of contrast agent while the initial ultrasonic signal is directed into and along the propagation path.

37. A system according to Claim 35, wherein:
the higher order harmonic components include a second order harmonic component and further, higher order harmonic components; and
the forming means includes means for forming the image principally from the second order harmonic component.

38. A system according to Claim 37, wherein the forming means also uses small contributions from the further, higher order harmonic components to form the image.

39. A system according to Claim 35, wherein:
the receiving means includes means for also receiving the first order component of the reflected distorted ultrasonic signal; and
the forming means includes a filter for removing from the received signals said first order component.

40. A system according to Claim 35, wherein the higher order harmonic components include a second harmonic component and further, higher order harmonic components, and wherein:

the receiving means includes means for receiving the first order component of the reflected distorted ultrasonic signal; and

the forming means includes means for removing from the received signals substantially everything other than said second order harmonic component.

41. A method of imaging a biological sample, comprising the steps of:

generating an initial ultrasonic signal at a fundamental frequency;

directing the ultrasonic signal into and along a propagation path in the sample, wherein the sample distorts the ultrasonic signal along the propagation path thereby to produce a distorted ultrasonic signal, wherein the distorted ultrasonic signal is comprised of a first order component signal and higher order harmonic component signals at the fundamental and higher order harmonic frequencies respectively, and further wherein the sample also reflects said distorted ultrasonic signal including the first order and the higher order hamonic components thereof;

receiving the reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal caused by the sample along the propagation path;

forming an image from the received distorted ultrasonic signal;

displaying the formed image;

enhancing the image by enhancing the contribution to the image from one of the higher order harmonic components of the received distorted ultrasonic signal; and

maintaining the sample free of contrast agent.

42. A method according to Claim 41, wherein the step of enhancing the image includes the step of improving the contrast and the lateral resolution of the image.

43. A method according to Claim 42, wherein the higher order harmonic components include a second order harmonic component and further, higher order components, and the step of enhancing the contribution from one of the higher order harmonic components includes the step of enhancing the contribution to the image from the second order harmonic component of the received distorted ultrasonic signal.

44. A method according to Claim 43, wherein the step of enhancing the contribution from the second order harmonic component includes the step of substantially remvoing from the received distorted ultrasonic signal substantially all components thereof except the second order harmonic component.

reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal caused by the tissue sample along the propagation path;

forming an image principally from one of said received higher order harmonic components of the reflected distorted ultrasonic signal; and

displaying said formed image.

49. A method according to Claim 48, further including the step of maintaining the tissue sample substantially free of any contrast agent while directing the initial ultrasonic signal into and along the propagation path in the tissue sample.

50. A method according to Claim 49, wherein:

the higher order harmonic component signals include a second order harmonic component and further, higher order harmonic components; and

the forming step includes the step of forming the image principally from the second order harmonic component.

51. A method according to Claim 50, wherein the step of forming the image principally from the second order harmonic component includes the step of useing small contributions from the further, higher order harmonic components to form the image.

52. A method according to Claim 48, wherein:

the receiving step includes the step of also receiving the first order component signal of the reflected distorted ultrasonic signal; and

the step of forming the image principally from one of the higher order component signals includes the step of removing from the received signals the first order component signal of the reflected distorted ultrasonic signal.

53. A method according to Claim 48, wherein:

the higher order harmonic component signals include a second order harmonic component and further, higher order harmonic components;

the receiving step includes the step of also receiving the first order component of the reflected distorted ultrasonic signal; and

the forming step includes the step of removing from the received signals substantially everything other than the second order harmonic component.